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EXAMINER

WOLDEKIDAN, HIBRET ASNAKE

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2613

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/585,320	Applicant(s) NIIHO ET AL.	
	Examiner Hibret A. Woldekidan	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07/06/06.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 July 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/06/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 6, it is stated that the multimode optical transmission path is a multi mode optical fiber. However, in claim 7 it is stated, "...multimode optical transmission path is a single mode optical fiber..." It is not clear how a multimode transmission path is a single mode fiber instead of being a multimode fiber. Appropriate correction is required.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1,6,8,15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stuart(6,525,853) in view of Morel et al. (US 2006/0013527)

Considering Claim 1 Stuart discloses a multimode optical transmission system for converting inputted electrical signals into optical signals, and performing multimode optical transmissions of the optical signals (**See Col. 4 lines 11-21, fig. 3 i.e. a laser system comprising a plurality of optical transmitters(36₁-36_n) for receiving RF signals and convert it to optical signals. The optical signals combined and**

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transmitted through a multimode fiber), the multimode optical transmission system comprising: a plurality of light sources for respectively converting the electrical signals into a plurality of optical signals respectively having different wavelengths, and respectively outputting the plurality of optical signals(See Col. 2 lines 5-9, Col. 4 lines 11-21, fig. 3 i.e. **a plurality of optical transmitters(36₁-36_n) for receiving a plurality of RF signals(30₁-30_n) and converting the received signals to the respective optical signals**); a wavelength multiplexing section for performing wavelength multiplexing of the plurality of optical signals outputted from the plurality of light sources, and outputting a resultant signal as a wavelength multiplexed signal(See Col. 2 lines 5-9, Col. 4 lines 11-21, fig. 3 i.e. **an optical combiner(38) for multiplexing a plurality of optical signals**); a multimode optical transmission path for optically transmitting in multimode the wavelength multiplexed signal outputted from the wavelength multiplexing section(See Col. 4 lines 15-21, fig. 3 i.e. **a multimode fiber(40) for receiving and transmitting the multiplexed signals from the an optical combiner(38)**); an extraction section for extracting, from the wavelength multiplexed signal transmitted on the multimode optical transmission path, optical signals each having a mode having a particular wavelength and a particular propagation constant(See Col. 4 lines 22-25, fig. 3 i.e. **an optical splitting unit(40) for extracting a plurality of data signals and transmitting the extracted signals to the respective optical detectors(42₁-42_n)**); and a plurality of optical receiving sections for respectively receiving the optical signals extracted by the plurality of optical signal extraction sections, and respectively converting the received optical signals into electrical

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signals(See Col. 4 lines 22-25, fig. 3 i.e. optical detectors(42₁-42_n) for converting the received optical signals into electrical signals).

Stuart does not explicitly disclose a plurality of optical signal extraction sections for respectively extracting, from the wavelength multiplexed signal transmitted on the multimode optical transmission path; and the wavelengths of the plurality of optical signals outputted from the light source are set, such that a propagation constant of a fundamental mode of an optical signal outputted from each light source and a propagation constant of a high order mode of an optical signal outputted from any other light source are different from each other

Morel teaches a plurality of optical signal extraction sections for respectively extracting, from the wavelength multiplexed signal transmitted on the multimode optical transmission path; and the wavelengths of the plurality of optical signals outputted from the light source are set, such that a propagation constant of a fundamental mode of an optical signal outputted from each light source and a propagation constant of a high order mode of an optical signal outputted from any other light source are different from each other(See Paragraph 32,33,23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber brag- gratings(105) for extracting the respective wavelengths(λ_1 - λ_9) from the received multiplexed signals of the multimode fiber(103); further fig. 3 illustrates that a plurality wavelengths each having a plurality of modes(Mode $p=0$ to Mode $p-20$) and a particular propagation constant. Fig. 3 further explains each wavelength has a different propagation constant and the propagation constant of each mode of a given wavelength is different from the rest).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Stuart, and have a plurality of optical signal extraction sections to respectively extract, from the wavelength multiplexed signal transmitted on the multimode optical transmission path and the wavelengths of the optical signals outputted from the light source to be set, such that a propagation constant of a fundamental mode of an optical signal outputted from each light source and a propagation constant of a high order mode of an optical signal outputted from any other light source are different from each other, as taught by Morel, thus providing an efficient transmission system by characterizing and selectively distributing the incoming optical signals to the sensing devices based on their respective characteristics, as discussed by Morel (Paragraph 4).

Considering claim 6 Stuart discloses the multimode optical transmission system according to claim 1, wherein the multimode optical transmission path is a multimode optical fiber(**See fig. 3 i.e. the optical transmission path is a multimode fiber(40)**).

Considering claim 8 Stuart discloses the multimode optical transmission system according to claim 1, wherein the multimode optical transmission path is a free space having a plurality of transmission paths(**Since the multimode fiber has multiple optical transmission path, it can be consider as a transmission path through a free space**).

Considering Claim 15 Stuart discloses a multimode optical transmission method for converting inputted electrical signals into optical signals, and performing multimode optical transmissions of the optical signals(**See Col. 4 lines 11-21, fig. 3 i.e. a laser**

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system comprising a plurality of optical transmitters(36₁-36_n) for receiving RF signals and convert it to optical signals. Performing multimode optical transmission using a multimode fiber(40)), the multimode optical transmission method comprising: a light outputting step of, by using a plurality of light sources, converting the electrical signals into a plurality of optical signals respectively having different wavelengths, and outputting the plurality of optical signals(See Col. 2 lines 5-9, Col. 4 lines 11-21, fig. 3 i.e. a plurality of optical transmitters(36₁-36_n) for receiving a plurality of RF signals(30₁-30_n) and converting the received signals to the respective optical signals); a wavelength multiplexing step of performing wavelength multiplexing of the plurality of optical signals outputted at the light outputting step, and outputting a resultant signal as a wavelength multiplexed signal(See Col. 2 lines 5-9, Col. 4 lines 11-21, fig. 3 i.e. a multiplexing step using an optical combiner(38) for multiplexing a plurality of optical signals); an optical transmission step of, via a multimode optical transmission path, optically transmitting in multimode the wavelength multiplexed signal outputted at the wavelength multiplexing step(See Col. 4 lines 15-21, fig. 3 i.e. a multimode fiber(40) for receiving and transmitting the multiplexed signals from the an optical combiner(38)); an optical signal extracting step of extracting, from the wavelength multiplexed signal transmitted via the multimode optical transmission path(See Col. 4 lines 22-25, fig. 3 i.e. an optical splitting unit(40) for extracting a plurality of data signals and transmitting the extracted signals to the respective optical detectors(42₁-42_n)); and a light receiving step of receiving the plurality of optical signals extracted at the optical signal extracting

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step, and converting the received optical signals into a plurality of electrical signals(**See Col. 4 lines 22-25, fig. 3 i.e. optical detectors(42₁-42_n) for converting the received optical signals into electrical signals**).

Stuart does not explicitly disclose extracting a plurality of optical signals each having a plurality of modes each having a particular wavelength and a particular propagation constant; and the wavelengths of the plurality of optical signals outputted from the light sources are set, such that a propagation constant of a fundamental mode of an optical signal outputted from each light source and a propagation constant of a high order mode of an optical signal outputted from any other light source are different from each other.

Morel teaches a plurality of optical signal extraction sections for extracting a plurality of optical signals each having a plurality of modes each having a particular wavelength and a particular propagation constant; and the wavelengths of the plurality of optical signals outputted from the light source are set, such that a propagation constant of a fundamental mode of an optical signal outputted from each light source and a propagation constant of a high order mode of an optical signal outputted from any other light source are different from each other(**See Paragraph 32,33,,23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber brag- gratings(105) for extracting a particular wavelength(λ_1 - λ_9) from the received multiplexed signals of the multimode fiber(103); further fig. 3 illustrates that a plurality of optical signal wavelengths each having a plurality of modes(Mode p=0 to Mode p-20) and a particular propagation constant. The figure further explains a different**

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propagation constant for the wavelengths of a plurality of optical signals with different modes (Mode $p=0$ to Mode $p=20$). As illustrated in the figure each wavelength has a different propagation constant. As further illustrated the propagation constant each mode of a given wavelength is different from each other).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Stuart, and have a plurality of optical signal extraction sections for extracting a plurality of optical signals each having a plurality of modes each having a particular wavelength and a particular propagation constant and have the wavelengths of the optical signals outputted from the light source to be set, such that a propagation constant of a fundamental mode of an optical signal outputted from each light source and a propagation constant of a high order mode of an optical signal outputted from any other light source are different from each other, as taught by Morel, thus providing an efficient transmission system by characterizing and selectively distributing the incoming optical signals to the sensing devices based on their respective characteristics, as discussed by Morel (Paragraph 4).

3. Claims 2,4,9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stuart(6,525,853) in view of Morel et al. (US 2006/0013527) further in view of Ip (5,608,825).

Considering Claim 2 Stuart and Morel disclose the multimode optical transmission system according to claim 1, wherein the plurality of optical signal

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extraction sections each include an optical reflection section for reflecting a corresponding one of the optical signals each having the mode having the particular wavelength and the particular propagation constant **(See Paragraph 23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber brag- gratings(105) for reflecting out a particular wavelength from the received multiplexed signals of the multimode fiber(103); As showed in the fig. the first FBG reflect out (λ_1 - λ_3), the second FBG reflect out (λ_2 - λ_6), and the third FBG reflect out (λ_7 - λ_9).**

Stuart and Morel do not specifically disclose a reflected optical signal extraction section for extracting the optical signal reflected by the optical reflection section.

Ip teaches a reflected optical signal extraction section for extracting the optical signal reflected by the optical reflection section **(See Col. 3 lines 28-37, fig. 5 i.e. a demultiplexing unit comprising a plurality of reflected optical signal extraction sections(C1-C8) for respectively extracting each wavelengths(λ_1 - λ_8) reflected by the respective fiber brag-grating (G1-G8)The first circulator pass all the wavelength to the first grating(G1). The first grating(G1) reflects back the first wavelength(λ_1) to the first circulator(C1) while it passes the rest of the wavelengths(λ_2 - λ_8) to the second circulator(C2). The reflected first wavelength(λ_1) get extracted out at the first circulator(C1). The same process is repeated at each grating and circulating unit until all the wavelengths being extracted).**

It would have been obvious to one of ordinary skill in the art at the time the

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invention was made to modify the invention of Stuart and Morel, and have the demultiplexing unit to include a plurality of extracting and reflecting units for extracting the optical signal reflected by the optical reflection section, as taught by Ip, thus providing a cost efficient demultiplexing unit which has a plurality of extraction unit for outputting the respective wavelengths, as discussed by Ip (Col. 1 lines 44-47).

Considering Claim 4 Stuart and Morel disclose the multimode optical transmission system according to claim 1, wherein the plurality of optical signal extraction sections each are an optical filter for transmitting a corresponding one of the optical signals each having the mode having the particular wavelength and the particular propagation constant **(See Paragraph 23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber bragg- gratings(105) for reflecting out a particular wavelength from the received multiplexed signals of the multimode fiber(103); As showed in the fig. the first FBG reflect out (λ_1 - λ_3), the second FBG reflect out (λ_2 - λ_6), and the third FBG reflect out (λ_7 - λ_9),**

Ip further teaches reflecting any other optical signals **(See Col. 2 lines 54-67, fig. 1 i.e. extracting a particular wavelength(λ_8) and reflecting backward the rest of the wavelength(λ_1 - λ_7)).**

Considering Claim 9 Ip teaches the multimode optical transmission system according to claim 2, wherein the optical reflection section is a Fiber Bragg Grating **(See Col. 2 lines 54-67, fig. 1 since the fiber-bragg grating(G8-G2) passes a particular wavelength and reflecting back the rest of the incoming wavelengths to the next grating units, the grating units are reflectors).**

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Considering Claim 10 Stuart and Morel disclose the multimode optical transmission system according to claim 2, wherein the optical reflection section is an optical filter for transmitting a corresponding one of the optical signals each having the mode having the particular wavelength and the particular propagation constant(**See Paragraph 23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber brag-gratings(105) for reflecting out a particular wavelength from the received multiplexed signals of the multimode fiber(103); As showed in the fig. the first FBG reflect out (λ_1 - λ_3), the second FBG reflect out (λ_2 - λ_6), and the third FBG reflect out (λ_7 - λ_9)).**

Ip further teaches reflecting any other optical signals (**See Col. 2 lines 54-67, fig. 1 i.e. extracting a particular wavelength(λ_8) and reflecting backward the rest of the wavelength(λ_1 - λ_7)).**

Considering Claim 11 Ip teaches the multimode optical transmission system according to claim 2, wherein the reflected optical signal extraction section is an optical circulator(**See Col. 3 lines 28-37, fig. 5 i.e. the optical signal extraction section are circulators(C1-C8)).**

Considering Claim 12 Ip teaches the multimode optical transmission system according to claim 2, wherein the reflected optical signal extraction section is a photocoupler(**See, fig. 5 i.e. since the optical circulators(C1-C7) have one optical input and multiple outputs, they can be considered as photo couplers).**

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4. Claims 3,5,13,14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stuart(6,525,853) in view of Morel et al. (US 2006/0013527) further in view of Ip (5,608,825) further in view of Beacken (US 2004/0105675)

Considering Claim 3 Stuart, Morel and Ip disclose the multimode optical transmission system according to claim 1, wherein the plurality of optical signal extraction sections each include a plurality of optical reflection sections for respectively reflecting optical signals each having a mode having a particular wavelength and a particular propagation constant **(See Morel: Paragraph 23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber brag- gratings(105) for reflecting out a particular wavelength from the received multiplexed signals of the multimode fiber(103); As showed in the fig. the first FBG reflect out (λ_1 - λ_3) reflect the rest to the next FBG unit, the second FBG reflect out (λ_2 - λ_6), and the third FBG reflect out (λ_7 - λ_9), a plurality of reflected optical signal extraction sections for respectively extracting the optical signals reflected by the plurality of optical reflection sections(See Ip: Col. 3 lines 28-37, fig. 5 i.e. a plurality of reflected optical signal extraction sections(C1-C8) for respectively extracting each wavelengths(λ_1 - λ_8) reflected by the respective fiber brag-grating (G1-G8)).**

Stuart, Morel and Ip do not specifically disclose a plurality of optical delay sections for respectively adding appropriate delays to the optical signals extracted by the plurality of reflected optical signal extraction sections, and a multiplexing section for multiplexing the optical signals respectively outputted via the plurality of optical delay sections.

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Beacken teaches a plurality of optical delay sections for respectively adding appropriate delays to the optical signals extracted by the plurality of reflected optical signal extraction sections(See Paragraph 59, fig. 7 a plurality of optical delay units(730-l,730-j,...) for adding appropriate delay to the signal extracted through the grating unit(720-l,720-j)), and a multiplexing section for multiplexing the optical signals respectively outputted via the plurality of optical delay sections(See Paragraph 62, fig. 7 a multiplexing unit(760) for combining the signals outputted from the optical delay units(730-l,730-j,...)).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Stuart, Morel and Ip, and have the demultiplexing unit to include a plurality of extracting unit for outputting the respective wavelength, as taught by Beacken, thus providing an efficient transmission unit by using a delay unit to minimize signal collision in the transmission system, as discussed by Beacken (See Paragraph 11).

Considering Claim 5 Stuart and Morel disclose the multimode optical transmission system according to claim 1, wherein the plurality of optical signal extraction sections each include a plurality of optical filters for respectively transmitting optical signals each having a mode having a particular wavelength and a particular propagation constant(See Paragraph 23, fig. 3, 6 i.e. as illustrated in fig. 6 a plurality of fiber brag- gratings(105) for reflecting out a particular wavelength from the received multiplexed signals of the multimode fiber(103); As showed in the fig.

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the first FBG reflects out (λ_1 - λ_3), the second FBG reflects out (λ_2 - λ_6), and the third FBG reflects out (λ_7 - λ_9).

Ip further teaches reflecting any other optical signals **(See Col. 2 lines 54-67, fig. 1 i.e. extracting a particular wavelength(λ_8) and reflecting backward the rest of the wavelength(λ_1 - λ_7)).**

Beacken further teaches a plurality of optical delay sections for respectively adding appropriate delays to the optical signals transmitted through the plurality of optical filters**(See Paragraph 59, fig. 7 a plurality of optical delay units(730-l,730-j,...) for adding appropriate delay to the signal extracted through the grating unit(720-l,720-j))**, and a multiplexing section for multiplexing the optical signals respectively outputted via the plurality of optical delay sections**(See Paragraph 62, fig. 7 a multiplexing unit(760) for combining the signals outputted from the optical delay units(730-l,730-j,...))**.

Considering Claim 13 Beacken further teaches the multimode optical transmission system according to claim 3, wherein the plurality of optical delay sections each are optical waveguide**(See Paragraph 59, fig. 7 a plurality of optical delay units(730-l,730-j,...) are optical fibers)**.

Considering Claim 14 Beacken further teaches the multimode optical transmission system according to claim 3, wherein the plurality of optical delay sections each adjust a delay amount by changing a refractive index of an optical transmission path**(See Paragraph 65 i.e. improving the refractive index of a fiber optics which is used as an optical delay section)**.

Conclusions

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hibret A. Woldekidan whose telephone number is (571)270-5145. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on 5712723078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. A. W./
Examiner, Art Unit 2613

/Kenneth N Vanderpuye/
Supervisory Patent Examiner, Art Unit 2613